

June 3, 2022

Denise Keehner
Director
Office of Pollution Prevention and Toxics
United States Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460-0001

Re: TSCA Section 6(g) Exemption Request for Use of N-methylpyrrolidone and Methylene Chloride in Production of Specialized Batteries

Dear Ms. Denise Keehner:

EaglePicher Technologies, LLC (EaglePicher) appreciates the opportunity to submit these comments in support of its request that the United States Environmental Protection Agency (EPA or Agency) grant exemptions under the Toxic Substances Control Act (TSCA) Section 6(g) for its uses of N-methylpyrrolidone (NMP) and methylene chloride in the production of specialized battery systems. As described in detail below, EaglePicher's uses of NMP and methylene chloride to produce battery systems for military, space, and medical applications meet the criteria for exemption under 15 U.S.C. § 2605(g).

EaglePicher is a world-class manufacturer of specialty batteries for use in uniquely demanding, mission-critical environments. EaglePicher specializes in providing sophisticated, highly engineered batteries that are essential for military, space exploration, and medical uses where precision and complete confidence is needed. EaglePicher batteries played critical roles in the Mercury, Gemini, and Apollo spaceflights during the 1960s and 1970s, and more recently, on the Space Shuttle, the International Space Station, the Hubble Space Telescope, missions to Venus and Mars, the Mars Rovers Spirit and Opportunity, and the Mars Science Laboratory. More than 600 satellites currently in orbit are operating under EaglePicher power, including satellites for telecommunications, navigation, weather forecasting, scientific missions, and defense applications. EaglePicher supplies power for over 90% of the U.S. military's munitions and mission critical systems, including batteries for long-range missiles, and batteries needed in defense-related weaponry for tactical short-range applications, including missiles, munitions, and guided bombs. EaglePicher also manufactures the world's smallest human-implantable battery, which exists to power lifesaving state-of-the-art technologies.

I. CRITERIA FOR A SECTION 6(G) EXEMPTION

Under 15 U.S.C. § 2605(g), EPA is authorized to grant an exemption from a risk management rule if the Administrator makes one of three separate findings:

“(A) the specific condition of use is a critical or essential use for which no technically and economically feasible safer alternative is available, taking into consideration hazard and exposure;

(B) compliance with the requirement, as applied with respect to the specific condition of use, would significantly disrupt the national economy, national security, or critical infrastructure; or

(C) the specific condition of use of the chemical substance or mixture, as compared to reasonably available alternatives, provides a substantial benefit to health, the environment, or public safety.”

In proposing an exemption under Section 6(g), the Administrator is to “analyze the need for the exemption”¹ and establish a time period for the exemption and promulgate reasonable conditions “to the extent that the Administrator determines the conditions are necessary to protect health and the environment while achieving the purposes of the exemption.”²

Section 6(g) exemptions are unique in the context of TSCA. They are a mechanism that recognizes that certain chemical uses are important enough to warrant the accompanying risk, even if it could be deemed unreasonable in other circumstances.³

II. SECTION 6(G) EXEMPTIONS AS APPLIED TO EAGLEPICHER'S ACTIVITIES

EaglePicher's uses of NMP and methylene chloride in its battery production activities are unique, narrow, and highly specialized activities that fit squarely within the exemption criteria. TSCA §6(g)(1)(B) provides for an exemption where “compliance with the requirement, as applied with respect to the specific condition of use, would significantly disrupt the national economy, national security, or critical infrastructure.” EaglePicher's use of NMP and methylene chloride to produce mission-critical lithium ion and silver oxide zinc batteries warrants exemption under this subsection because preventing this use would significantly disrupt national security.

A. *EaglePicher's Use of NMP to Make Batteries for Military and Space Applications is Vital to National Security and Should Be Exempt under TSCA §6(g)(1)(B).*

EaglePicher produces lithium and lithium ion batteries that are used in critical energy storage applications in military and space exploration settings, including defense applications such as precision guided weapons, missiles, torpedoes, directed energy weapons, military airframes, satellites, space launch vehicles, and spacecraft (collectively, the “National Security Batteries”). Given their critical role, the National Security Batteries must deliver unparalleled performance 100% of the time in incredibly demanding environments. As detailed below, NMP plays an essential role in producing National Security Batteries that deliver the consistent perfection required. Without NMP, the potential consequences to national security are grave: missiles that do not launch, munitions that fail at a mission-critical moment, and satellites that shut down and

¹ 15 U.S.C. § 2605(g)(2).

² *Id.* at (g)(3), (g)(4).

³ The Congressional Record accompanying the final bill text for the Lautenberg Act specifically states that “it is Congress' intent that the conditions EPA imposes will protect health and the environment to the extent feasible, recognizing that, by its nature, an exemption will allow for activities that present some degree of unreasonable risk.” *Id.* at S3517 (emphasis added).

cannot provide the tactical data needed to protect our country. Accordingly, the use of NMP for production of National Security Batteries should be exempted under Section 6(g)(1)(B) because compliance with a use restriction “as applied with respect to the specific condition of use, would significantly disrupt . . . national security.”

1. The Specific Condition of NMP Use

NMP plays an essential role in making the anodes and cathodes for EaglePicher’s National Security Batteries. While production occurs at two different facilities (Joplin, Missouri and East Greenwich, Rhode Island) the role of NMP is the same at both. EaglePicher blends the anode or cathode active powder and powdered carbon diluents with a binder (a polyvinylidene fluoride (PVDF) compound) that is dissolved in NMP. The cathode material is generally lithium metal oxide or lithium metal phosphate and the anode material is often natural or synthetic graphite. The amount of electrode active powder will determine the electric capacity while the carbon diluents enhance conductivity.

The NMP-containing binder and powders are enclosed in a mixer, blended and the resulting fully-mixed electrode slurry is transferred to a sealed, pressurized tank. The slurry is then pumped directly to a coater, where it is automatically spread onto a foil substrate via a sealed slot die or reverse comma coating head. This material then runs through a heated, negative pressure drying oven, where it undergoes a thermal drying process that causes the NMP binder to evaporate, leaving behind a dry “plate.” This plate is then used to form the anodes and cathodes that provide the crucial energy storage and performance capabilities needed for the defense applications served by the National Security Batteries.

The production process for these anodes and cathodes relies on NMP’s unique chemical properties, which cannot be replicated by other substances. NMP’s unique qualities make it a superior processing agent for the slurry that is used to create the anode and cathode electrode plates in EaglePicher’s lithium ion batteries. NMP does not react with cathode active powder containing lithium, unlike water from aqueous-based binders. Unlike other chemicals, NMP is unreactive toward the chemicals and thus evaporates without leaving any residue that would interfere with electrode performance. While aqueous solutions for the anode are common, aqueous solutions for the cathode cannot be used in place of NMP because the active powders react with water, negatively impacting product quality and creating immediate health and safety risks. Using NMP establishes the precise appropriate coating slurry pH that is required to allow the batteries to remain stable and continue to perform over extended time periods – as in space missions and with munitions that may be stored for an extended period before use. If NMP is not used, increased binder pH would have adverse effects including corroding the aluminum in the batteries.

Further, the advanced high-molecular weight PVDF binders used by EaglePicher are designed only for NMP-based slurries and allow lithium ion battery manufacturers to maximize battery energy density, a vital characteristic that is especially crucial for military applications. While providing excellent electrode adhesion, the property responsible for electrode mechanical integrity and longevity, these binders usually constitute a much lower fraction in the formulation of the electrode than that of their lower-molecular weight counterparts. This allows an increase of the electrode active material fraction, resulting in a much greater electric capacity. This is critical to the level of performance needed for high power battery applications such as those for the B2 Bomber, Global Hawk and several Directed Energy applications.

Another very important consideration for NMP use is that many National Security Batteries must perform in very low temperature harsh environments, including temperatures down to -40°C , as well as high shock and vibration environments. That means the binder must remain flexible at these conditions in order for batteries to function (e.g., in military aircraft).

Battery electrodes manufactured with NMP-based binders show consistently superior performance at temperatures below -10°C – particularly as compared to batteries manufactured with aqueous binders (such as styrene-butadiene rubber (SBR) and carboxymethyl cellulose (CMC)).⁴ The improved performance is attributed to a “gentler” and lower Glass Transition Temperature (T_g). T_g characterizes a property of material, such as polymer binder, to reversibly transition from a viscous or rubbery state to a “glassy” or brittle state. When the temperature drops below the T_g value, the binder (which bonds all elements of the electrode together) can become rigid and brittle, causing cracks in the electrode surface and even delamination of the electrode coating from the current collector. This effect is even worse when the phase change is associated with a significant size change, as is the case for non-NMP based binders. These transitions reduce battery life and can ultimately result in catastrophic battery failure.

The PVDF binders used in EaglePicher's lithium ion battery manufacturing have T_g values lower than -40°C , while most aqueous binders are characterized by T_g values of 0°C or warmer. All major military and space applications, such as aircraft (F-35, B2 Stealth Bomber), radios and Mars Missions etc., require batteries to function in very harsh conditions, including operation to -40°C and storage at -54°C .⁵ In fact, EaglePicher is working on an improved low temperature battery program for the U.S. Army that would require operation to -60°C with even colder storage required.

⁴ See, e.g., Jui-Pin Yen, Chia-Chin Chang, Yu-Run Lin, Sen-Thann Shen, Jin-Long Hong, *Journal of The Electrochemical Society*, 2013, Vol. 160 (10), A1811-A1818; see also, e.g., Ji-Yong Eom, Lei Cao, *Journal of Power Sources*, 2019, Vol. 441, Article 227178.

⁵ See Thermal Control of Mars Rovers and Landers Using Mini Loop Heat Pipes Gajanana C. Birur*, Michael T. Pauken, and Keith S. NovakJet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA, available at https://www.academia.edu/3333883/Thermal_Control_of_Mars_Rovers_and_Landers_Using_Mini_Loop_Heat_Pipes

Figure 1 below illustrates the mechanical damage that occurs in an anode made with aqueous-based binder, when exposed to low temperatures:

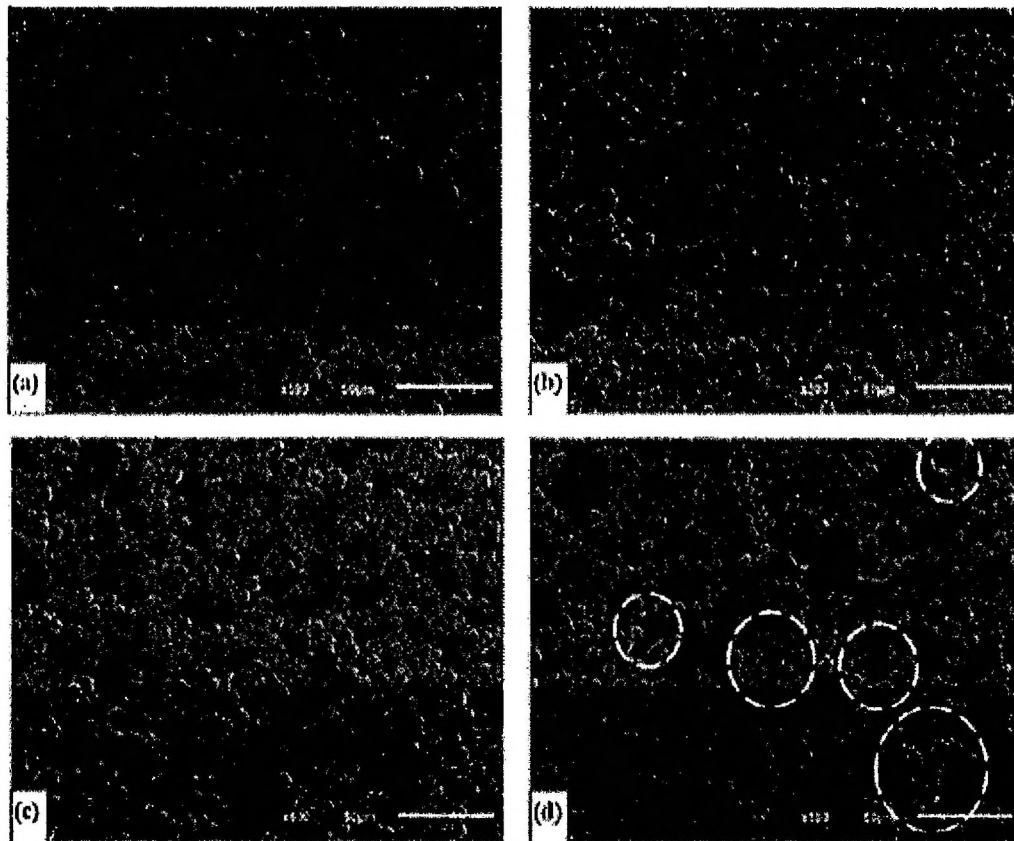


Figure 1. SEM micrographs at 500X magnification of anode electrodes: (a) SMA @PVDF before cold/heat shock; (b) SMA @SBR/CMC before cold/heat shock; (c) SMA @PVDF after cold/heat shock; (d) SMA @SBR/CMC after cold/heat shock.

2. Disruption to National Security if NMP Use is Restricted

If EaglePicher's use of NMP for National Security Batteries were to be restricted by a TSCA Section 6 rule, the disruption to national security would be dire. Simply put, if the National Security Batteries do not perform as designed then missiles don't fire, fighter jets crash, and satellites go dark. The National Security Batteries are indispensable to the defense systems they power and they must provide consistently flawless operation. To do so, EaglePicher must use NMP to impart the necessary battery performance capabilities.

EPA has previously recognized the critical role of NMP in maintaining national security. The Agency contemplated exemptions under Section 6(g) for the use of NMP to protect national security in a 2017 proposed rule regarding the use of NMP for paint and coating removal-related

uses.⁶ In the Federal Register notice to the proposed rule, EPA stated that “there are specific military uses for which NMP is essential . . . and for which there are not technically feasible alternatives currently available,” such as using NMP for the maintenance of mission-critical corrosion-sensitive components on military aviation and vessels.⁷ EPA explained that “[t]he military readiness of DOD’s warfighting capability is paramount to ensuring national security, which includes ensuring the maintenance and preservation of DOD’s warfighting assets.”⁸

EaglePicher’s National Security Batteries are essential components of the country’s defense capabilities. The 2017 rule recognized the important use of NMP for removal of paints and coatings to maintain national security equipment. In the National Security Battery context, NMP plays an even more critical role: powering the aircraft, spacecraft, and weaponry that protect the United States on a daily basis. As EPA stated in proposing the earlier NMP exemption, maintaining military readiness is “paramount to ensuring national security.”⁹ EaglePicher’s National Security Batteries must meet the unique challenge of such military readiness by storing substantial amounts of energy for years or decades and then performing immediately under highly demanding circumstances. For example, satellite functionality relies on the ability to store over ten years of data on how those satellites perform in practice. Removing NMP from the National Security Batteries that power those satellites would mean loss of a historically stable chemistry system that preserves the crucial data. Starting over with unproven batteries could mean catastrophic satellite failure. As explained above, NMP is required to create exceptionally long-lasting batteries that will stand the test of time.

EaglePicher is expressly required to use NMP under the terms of its contracts to supply National Security Batteries to the Department of Defense, NASA, and others. These entities establish and require their suppliers, including EaglePicher, to adhere to very precise design and manufacturing specifications which specifically mandate the use of NMP. They do so because no other substance has been shown to impart the performance (life, temperature, power, vibration, etc.) needed for the National Security Batteries.¹⁰ As party to these defense-related agreements, EaglePicher is a crucial link in a complex supply chain supporting our national security needs. Restricting EaglePicher’s use of NMP in its National Security Batteries would create disruptions that ripple through the military supply chain, risking significant market disruption that goes well beyond the obvious adverse effects caused by battery failure. Similarly, it is worth noting that many of the National Security Batteries are used in classified projects to which EaglePicher is not privy. As such, the additional effects of NMP restriction on these most sensitive projects are unknown but undoubtedly significant to national security.

EaglePicher relies on NMP’s unique chemical properties to produce the National Security Batteries that keep us safe. Accordingly, the use of NMP is required by governmental entities to ensure our aircraft, spacecraft, and weaponry will perform in challenging environments and meet national security demands. Because EaglePicher’s use of NMP in the production of National Security Batteries is a condition of use which, if restricted, would significantly disrupt national security, we request that EPA exempt this use pursuant to 15 U.S.C. § 2605(g)(1)(B).

⁶ 82 Fed. Reg. 7464 (Jan. 19, 2017). The proposed rule also pertains to the use of methylene chloride, as discussed further below.

⁷ *Id.* at 7517 – 7518.

⁸ *Id.* at 7517.

⁹ *Id.*

¹⁰ See *supra* note 5. Note that the specific performance requirements for EaglePicher’s lithium ion batteries for such uses are controlled under the International Traffic in Arms Regulations (ITAR), 22 CFR §§ 120-130, and restricted from disclosure.

B. EaglePicher's Use of Methylene Chloride to Make Batteries for Military and Space Applications is Vital to Maintain National Security and Should Be Exempt under 6(g)(1)(B).

EaglePicher similarly relies on the use of methylene chloride to produce National Security Batteries that can meet the performance demands referenced above in Section II(A). Like NMP, methylene chloride plays a vital role in EaglePicher's National Security Battery production. A use restriction would result in inoperable tactical underwater vehicles, weapons that fail to deploy, and space launch vehicles that lack the power necessary to operate. Further, the use of the methylene chloride is essential to facilitate seal integrity of the battery cases and to prevent cracks which cause internal short circuits or loss of power – a serious safety risk. Therefore, the use of methylene chloride for production of National Security Batteries should be exempted under Section 6(g)(1)(B) because compliance with a use restriction “as applied with respect to the specific condition of use, would significantly disrupt . . . national security.”

1. Specific Condition of Methylene Chloride Use

Methylene chloride plays a unique role in producing hermetic casings for the battery cell anodes and cathodes that are sufficiently strong for use in the National Security Batteries. Methylene chloride is used as a bonding agent for assembling the plastics and/or polymers used in EaglePicher's battery casings. Specifically, EaglePicher uses methylene chloride as a component of solvent cement for bonding acrylics at its Joplin facility. The solvent cement containing methylene chloride is pumped into a container using a closed tubing system. Solvent cement to be used for bonding flows into a ventilated reservoir with the plastic parts to be bonded. The plastic parts remain in the ventilated reservoir for two to three minutes and are then moved to a ventilated enclosure to cure using clamps or weights to properly attach the parts during the curing and setting process. The solvent cement is then flowed into a hazardous waste container for proper disposal.

At its East Greenwich, Rhode Island facility, EaglePicher uses methylene chloride in cell case assemblies, including bonding and sealing of the case itself and as a component in styrene-acrylonitrile (SAN) cement used to affix a wicking pad to the cell case. For cell case assembly, methylene chloride is transferred from a one-quart container into a one-ounce dispensing bottle where it is used to bond the cell cover to the cell case. The case and cover are placed in a jig to form a tight bond.

For the SAN cement process, methylene chloride is transferred from a one-quart container to a one-gallon can. SAN pellets are added to the one-gallon can, and the can is sealed and placed in a paint mixer for a 90-minute mixing process. The SAN cement mix is then transferred to a one-ounce applicator bottle where it is applied to the fabric wicking pad to be bonded to the internal cell case.

EaglePicher relies on methylene chloride as a bonding agent for assembly of the plastic casings in its National Security Batteries. The casing houses and protects the cell anodes and cathodes, making it a critically important battery component. During the solvent bonding process, methylene chloride dissolves the plastic slightly, allowing the polymers to form a physical bond comprised of the parent material. This results in a fully bonded battery casing which acts as a single “unit” rather than individual pieces integrated with layers of a different material. The fabric wicking pad, attached to the internal cell case wall with SAN cement, is necessary to absorb free electrolytes from within the battery to prevent unintentional discharge. Methylene chloride (as a component of the SAN cement) must be used to protect the integrity of

the cell case as a whole, as use of another agent would affect material compatibility and could lead to devastating micro-cracks in the cell casing.

Methylene chloride is the superior bonding agent for this process because of its unique evaporative qualities. Methylene chloride's low evaporation rate results in a higher degree of polymer bonding and a stronger casing, because there is less residue to inhibit the bonding process. Other solvents, such as ketones, cannot successfully replace methylene chloride. At present, methylene chloride is the only substance known that enables EaglePicher to produce battery casings of sufficient strength and durability for use in the National Security Batteries which must function in exceedingly high stress and high shock environments.

2. Disruption to National Security if Methylene Chloride Use is Restricted

As with NMP, if EaglePicher's use of methylene chloride for National Security Batteries were to be restricted by a TSCA Section 6 rule, the disruption to national security would be significant. Methylene chloride is required to create sufficiently durable casings for the electrodes. If the casings break or become damaged due to the high stress environments inherent in their use, the compromised battery performance will result in mission failure. This would be catastrophic to the aviation, aerospace and munition applications in which the National Security Batteries operate. Not only would missiles or spacecraft fail to launch without battery power, a fire in these settings could cause significant risk, destruction and loss of life. The use of methylene chloride is essential to create adequately protective casings for the National Security Batteries.

In the same 2017 proposed rule in which EPA recognized the need for a Section 6(g) exemption for the use of NMP for national security purposes, the Agency also discussed the need for an exemption for the use of methylene chloride for paint and coating removal critical for national security purposes.¹¹ Similar to its discussion of NMP's role in national security, EPA explained that "DOD has identified mission-critical uses for methylene chloride for ensuring military aviation and vessel readiness," which is "paramount to ensuring national security."¹² The rule additionally noted that in such "critical and essential applications," currently available substitute chemicals did not perform as well as methylene chloride and accordingly resulted in "reduced availability and mission readiness of military aircraft and vessels" as well as the potential for damage to critical components, creating an "increased risk of catastrophic failure of safety critical parts."¹³

The role of methylene chloride in the production of EaglePicher's National Security Batteries is essential to ensuring our warfighting assets will perform as needed. As noted above, a cracked battery casing not only causes battery failure, but can also disable range safety batteries with potential loss of life. The National Security Batteries operate in settings which subject them to significant vibration, temperature stress, and pressure changes. The use of methylene chloride is required to create a cell casing that is able to consistently withstand these stresses.

Further, EaglePicher cannot substitute for methylene chloride by the terms of its contracts with various governmental and other entities in the national security context.¹⁴ These contracts require the use of methylene chloride because of its proven bonding capabilities and in

¹¹ 82 Fed. Reg. 7464 (Jan. 19, 2017).

¹² *Id.* at 7489.

¹³ *Id.* at 7490.

¹⁴ See *supra* Section 2(a)(ii) discussing parallel requirements for the use of NMP in contracts to produce National Security Batteries.

recognition of the lack of adequate chemical substitutes. Changing the composition of an adhesive to substitute another chemical substance for methylene chloride would be a year-long undertaking (at a minimum) for NASA-approved processes, which would mean substantial negative impacts to the viability of the systems powered by the National Security Batteries in the interim. The use of methylene chloride is needed to ensure our aircraft, spacecraft, and weaponry meet national security demands. Because EaglePicher's use of methylene chloride in the production of National Security Batteries is a condition of use which, if restricted, would significantly disrupt national security, we request that EPA exempt this use pursuant to 15 U.S.C. § 2605(g)(1)(B).

C. EaglePicher's Use of NMP to Make Batteries for Military and Space Applications is a Critical Use and Should Be Exempt under 6(g)(1)(A).

TSCA §6(g)(1)(A) provides for an exemption when "the specific condition of use is a critical or essential use for which no technically and economically feasible safer alternative is available, taking into consideration hazard and exposure." EaglePicher's use of NMP to produce National Security Batteries should be exempted under this subsection because such use meets all three required elements, as detailed below.

1. EaglePicher's Specific Condition of use of NMP is a Critical and Essential Use

The first element under TSCA §6(g)(1)(A) is that the specific condition of use be "critical or essential." As described above in Section 2(a)(i), EaglePicher uses NMP in narrowly and precisely defined manufacturing steps in the production of its National Security Batteries. Specifically, NMP is used to create anodes and cathodes that are able to meet the performance demands required for mission-critical national security applications. As neither Congress nor EPA has provided further statutory or regulatory instruction on the meaning of "critical" or "essential" in this context, EPA must look to the ordinary meaning of these terms.¹⁵ Under any common meaning, EaglePicher's use of NMP to make the National Security Batteries is both "critical" and "essential."

"Critical" is defined to mean "tending to determine or decide; decisive, crucial."¹⁶ "Essential" is defined to mean "absolutely necessary, indispensably requisite."¹⁷ The use of NMP in the production of National Security Batteries is critical because NMP's chemical qualities are crucial to the ability of the batteries to perform as required: NMP's high evaporation rate means that it leaves no residue on the electrode "plate," enabling EaglePicher to create high-performance electrodes that can power the high-demand units in which they operate and will not corrode the aluminum; NMP renders the Tg of the batteries lower than those made with non-NMP binders, resulting in National Security Batteries that are sufficiently flexible to operate in extremely low temperatures; finally, the NMP-based binder EaglePicher uses (PVDF) has a high molecular weight which maximizes energy density for superior performance and longevity.

Additionally, the use of NMP determines whether EaglePicher is able to meet the contract specifications governing the production of the National Security Batteries because it is the only

¹⁵ *FDIC v. Meyer*, 510 U.S. 471, 476 (1994) (In the absence of a statutory definition, "we construe a statutory term in accordance with its ordinary or natural meaning.").

¹⁶ *Critical*, OXFORD ENGLISH DICTIONARY (OED Online Ed. June 2020).

¹⁷ *Essential*, OXFORD ENGLISH DICTIONARY (OED Online Ed. June 2020).

substance able to impart the characteristics necessary to allow consistently flawless high-power battery performance in extreme cold temperatures and over extensive periods of time. In the same vein, the use of NMP is "essential" because it is absolutely necessary and requisite for production of National Security Batteries that enable our country to maintain the national security through high-performance aviation and spacecraft.

2. There Is No Technically and Economically Feasible Safer Alternative to NMP

As described above in Section II(A)(2), NMP is the only substance known to impart the characteristics the National Security Batteries require to perform as needed. There is no technically and economically feasible safer alternative to NMP. NMP evaporates without leaving any residue on the plate that is the base material for the anodes and cathodes that comprise the most critical elements of the National Security Batteries. Other substances, such as aqueous solutions, negatively impact product quality and/or create health and safety risks due to the cathode powder's tendency to react with water.

As described above, NMP is the only chemical substance that can impart the needed Tg to allow the National Security Batteries to perform in high shock and vibration environments. Without NMP, the polymer binder in the National Security Batteries would not be adequately flexible and such high stress environments would cause cracking of the electrode surface and even delamination of the electrode coating from the current collector, resulting in battery failure. Because NMP binders have lower Tg values than aqueous binders, they have higher ionic conductivity and lower electrode electric resistance. These characteristics enable the National Security Batteries to perform as needed in high power applications such as EaglePicher's Directed Energy Weapons programs. As an industry leader for these mission-critical battery applications, EaglePicher is constantly researching new and better ways to produce its batteries. EaglePicher and other industry experts have done extensive work to identify and evaluate alternatives to NMP but have found no suitable substitute.

The National Security Batteries must perform 100% of the time in extreme environments – including very low temperatures, long idle periods, and high vibration settings – meaning there is no room for error. As such, no alternatives to NMP are feasible for use in the National Security Batteries.

3. The Risk of Hazard and Exposure is Low for EaglePicher's Condition of NMP Use

EaglePicher uses small quantities of NMP in particular steps of battery production. Its specific process and worker protection requirements (which are needed due to other process inputs) mean that the risk of hazard and exposure related to NMP is low for EaglePicher's condition of use. As a starting point, EaglePicher's manufacturing involves a batch process. Thus, the processes involving NMP occur only periodically. At its Joplin facility, EaglePicher employees prepare batches of NMP-containing slurry once or twice a day on just 3-4 days per week. The amount of NMP used at EaglePicher's facilities is negligible in comparison to other industrial manufacturing uses. EaglePicher's annual total use of NMP is orders of magnitude less than most other users.

Further, the limited manufacturing steps that involve NMP are highly controlled in a manner that minimizes exposure risks. EaglePicher receives only small, sealed containers of virgin NMP

and pre-mixed binder-NMP solution, with no associated exposure risks. At both facilities, the slurry containing the binder-NMP solution is blended in a sealed mixer. At the Joplin facility, the slurry is transferred either to a secondary sealed tank and pumped directly to the coater or pumped directly from the mixer to the coater. At the East Greenwich facility, the slurry is transferred from the mixer into a sealed tank and then pumped automatically to a negative pressure drying oven. The photographs below depict the production of electrode plates at EaglePicher's Joplin facility:



At both facilities, EaglePicher's employees wear extensive PPE that precludes inhalation or dermal contact during all processes involving NMP: for processes involving slurry materials, employees are required to wear a Tyvek suit, protective gloves, shoe covers, safety glasses, a hair net, beard net (if applicable), and face mask. For processes involving powders, employees are required to wear a Powered Air Purifying Respirator (PAPR) with a HEPA filter. Because EaglePicher employees use small amounts of NMP under tightly controlled processes, and wear Personal Protective Equipment ("PPE") such that all contact is prevented, the risk of hazard and exposure is low.

D. EaglePicher's Use of Methylene Chloride to Make National Security Batteries for Military and Space Applications is a Critical Use and Should Be Exempt Under 6(g)(1)(A).

Like its use of NMP described above, EaglePicher's use of methylene chloride to make National Security Batteries warrants exemption as a critical use pursuant to Section 6(g)(1)(A) because "the specific condition of use is a critical or essential use for which no technically and economically feasible safer alternative is available, taking into consideration hazard and exposure."

1. EaglePicher's Specific Condition of Use of Methylene Chloride is a Critical and Essential Use

EaglePicher's use of methylene chloride satisfies the first element required under Section 6(g)(1)(A) because its use is required to produce batteries casings that are sufficiently durable

to contain cell components. As described in Section II(B)(1) above, EaglePicher uses methylene chloride to bond the casing holding the battery electrodes. In ordinary parlance, the use of methylene chloride is "critical" to the National Security Batteries because it determines whether the bond holding the casing together will be strong enough to withstand the high-stress environments to which the National Security Batteries are subjected. Without methylene chloride, the bond strength will be insufficient, resulting in cracking when exposed to extreme temperatures and/or vibration. The use of methylene chloride is similarly "essential" because it is required to enable EaglePicher to produce adequately durable National Security Batteries, as described above.

2. There is No Technically and Economically Feasible Safer Alternative Available

Methylene chloride is the only known substance with the chemical properties needed to adequately bond EaglePicher's National Security Battery casings, as described above in Section II(B)(1). EaglePicher and other industry leaders have attempted to substitute various other substances, including other solvents such as ketones, but have not found any that can replace methylene chloride as a bonding agent. If the National Security Battery casings crack and cause mission failure, the batteries can ignite – meaning the use of alternative bonding agents is more than just infeasible, it is potentially catastrophic.

Further, as detailed above, the governmental and other entities for whom EaglePicher produces the National Security Batteries prevent the substitution for methylene chloride in their contract specifications, in recognition of the fact that there are no available alternatives to produce batteries for these mission-critical applications. EaglePicher must use methylene chloride to continue to produce the National Security Batteries in the manner required by the Department of Defense, NASA, and others.

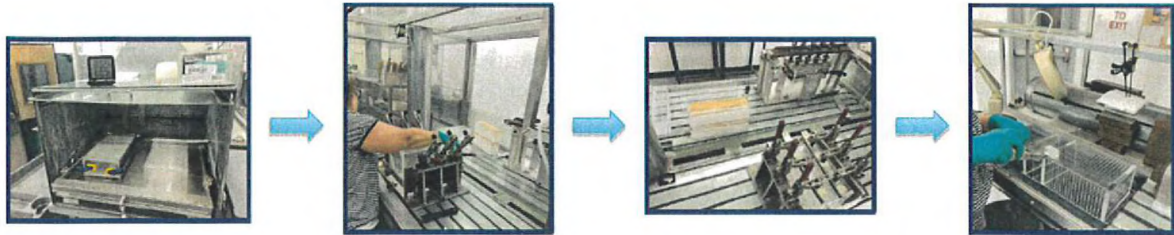
3. The Risk of Hazard and Exposure is Low for EaglePicher's Methylene Chloride Use

As with NMP, EaglePicher uses small quantities of methylene chloride in particular, well-controlled steps of battery production. EaglePicher employees wear PPE during all steps involving methylene chloride. Thus, the risk of hazard and exposure is low for EaglePicher's condition of use for methylene chloride.

At its Joplin facility, EaglePicher uses methylene chloride as a component of the solvent cement that is used for bonding casing materials. The solvent cement is moved through an entirely closed tubing system into a vented reservoir and vented enclosure for bonding and curing. After use, the solvent cement is flowed into a hazardous waste container for disposal. At its East Greenwich facility, EaglePicher uses methylene chloride in its cell case assembly and SAN cement processes. These processes involve very small amounts of methylene chloride under tightly controlled circumstances. As with NMP, the total amount of methylene chloride that EaglePicher uses to manufacture the National Security Batteries is extremely small and is orders of magnitude less than other industrial users.

EaglePicher employees wear PPE during all process steps involving methylene chloride at both facilities. Employees also wear protective smocks where there is splashing potential. Because EaglePicher employees use methylene chloride only in specific, highly controlled manufacturing

steps during which they are protected by appropriate PPE, the risk of hazard and exposure is low. The pictures below depict the use of methylene chloride at the Joplin facility:



The pictures below depict the use of methylene chloride at the East Greenwich Joplin facility:

Cell Case Assembly



San Cement



E. EaglePicher's Use of NMP to Make Batteries for Medical Device Applications is a Critical Use and Should Be Exempt Under 6(g)(1)(A).

EaglePicher also creates high-performance batteries used in critically important medical applications. EaglePicher's medical batteries are used in implantable cardiac devices (such as pacemakers, defibrillators, pumps, and resynchronization therapy devices) and neuromodulation devices (the "Medical Device Batteries"). These applications require flawless battery performance because the devices being powered sit inside the human body. As with the National Security Batteries, EaglePicher must use NMP to create Medical Device Batteries that meet the performance and longevity criteria required by the life-sustaining medical device batteries. If EaglePicher's Medical Device Batteries fail, people require surgery and can die. EaglePicher's use of NMP to create these batteries is therefore a critical use, meets all three elements under Section 6(g)(1)(A), and should be exempt.

1. EaglePicher's Specific Condition of use of NMP is a Critical and Essential Use

EaglePicher uses NMP to create the anodes and cathodes for its Medical Device Batteries in the same way it uses NMP to make its National Security Batteries, as described above in Sections II(A)(1) and II(C)(1). EaglePicher's use of NMP is both critical and essential because the use is crucial and absolutely necessary to the creation of medical device batteries that deliver the required power to perform flawlessly in the life-or-death scenarios in which the devices operate. The use of NMP prevents battery corrosion which would have severely negative impacts on functionality. And NMP enables EaglePicher to create Medical Device Batteries with enough energy density to consistently perform over long periods of time, a critical characteristic for medical device batteries. Patients rely on the medical devices powered by EaglePicher's batteries to perform life-sustaining functions and there is no room for error. If the battery powering a pacemaker or internal cardiac pump fails, the consequences will be dire for the device user. EaglePicher is committed to continuing to manufacture Medical Device Batteries that are able to perform consistently in this crucial medical context, and it must use NMP to do so.

2. There is No Technically and Economically Feasible Safer Alternative Available

As described above in Section II(A)(2) and II(C)(2), EaglePicher and other industry leaders have invested in searching for an alternative to NMP and have found none. There is no technically and economically feasible safer alternative to NMP for these critical medical applications.

3. The Risk of Hazard and Exposure is Low for EaglePicher's NMP Use

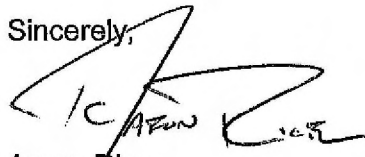
EaglePicher uses only small amounts of NMP during precise production steps in the manufacture of battery electrodes, as described above in Section II(C)(3). EaglePicher employees are protected from exposure by use of PPE during all steps involving NMP. There is no residual NMP in the batteries themselves, due to the evaporate efficiency of NMP. Thus, the risk of hazard and exposure is low for EaglePicher's NMP use in the production of Medical Device Batteries.

III. CONCLUSION

As described above, EaglePicher's use of NMP and methylene chloride to make National Security Batteries is required to maintain national security. EaglePicher therefore respectfully requests that the Agency grant exemptions for these uses pursuant to 15 U.S.C. § 2605(g)(1)(B). EaglePicher's use of NMP and methylene chloride to make National Security Batteries is also critical and essential and meets the requirements for exemption under 15 U.S.C. § 2605(g)(1)(A). EaglePicher therefore respectfully requests that the Agency grant exemptions for these uses pursuant to 15 U.S.C. § 2605(g)(1)(A). Finally, EaglePicher's use of NMP to make Medical Device Batteries is a critical and essential use, and EaglePicher respectfully requests that the Agency grant an exemption for this use pursuant to 15 U.S.C. § 2605(g)(1)(A).

EaglePicher sincerely appreciates the Agency's consideration of this request. Should you have any questions or need additional information, please contact Aaron Rice at Aaron.Rice@eaglepicher.com or (417) 208-1486.

Sincerely,

A handwritten signature in black ink, appearing to read 'Aaron Rice', with a large, stylized flourish above it.

Aaron Rice
Director of Environmental Health & Safety

